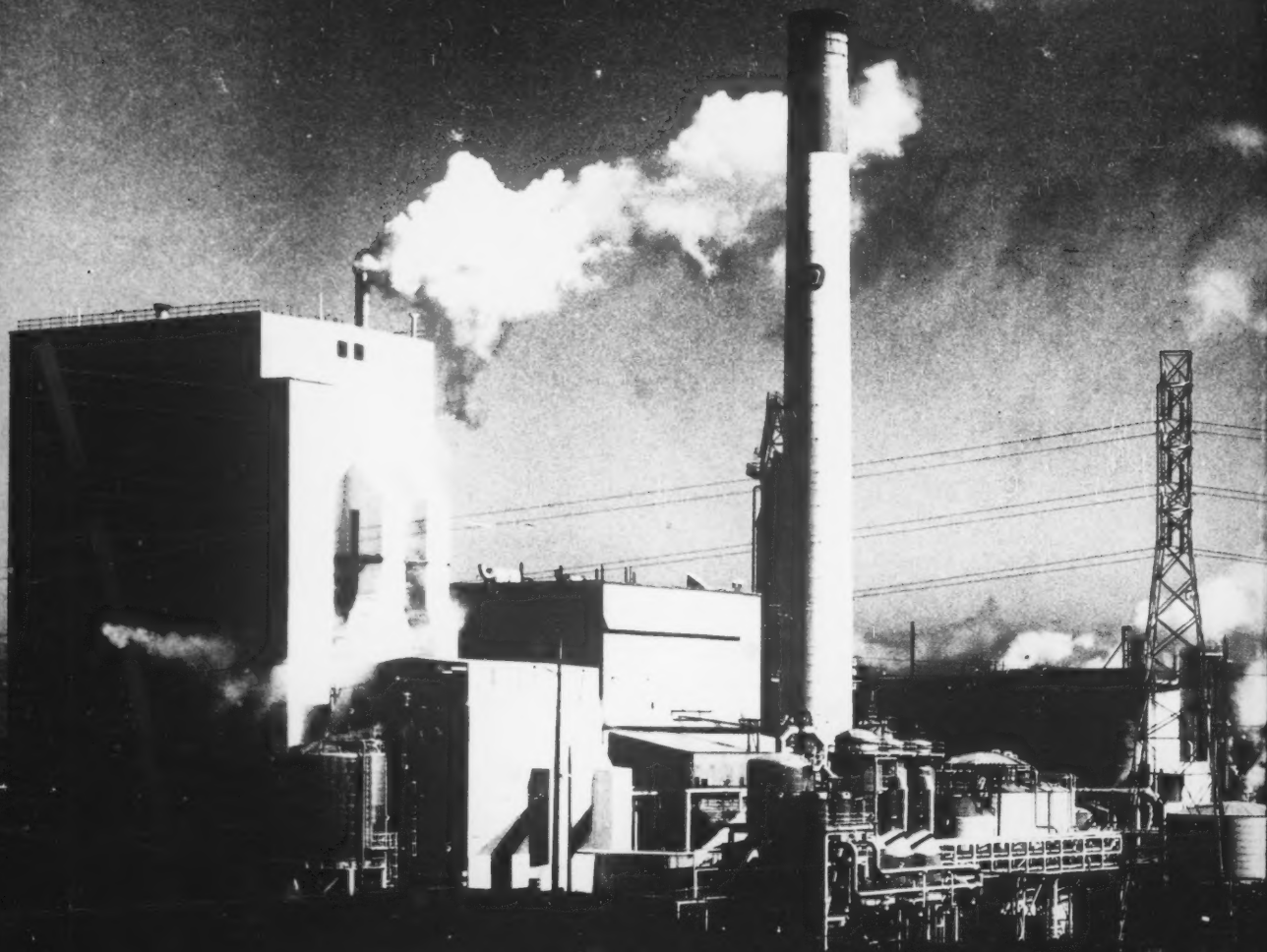


PULP & PAPER

February 1991



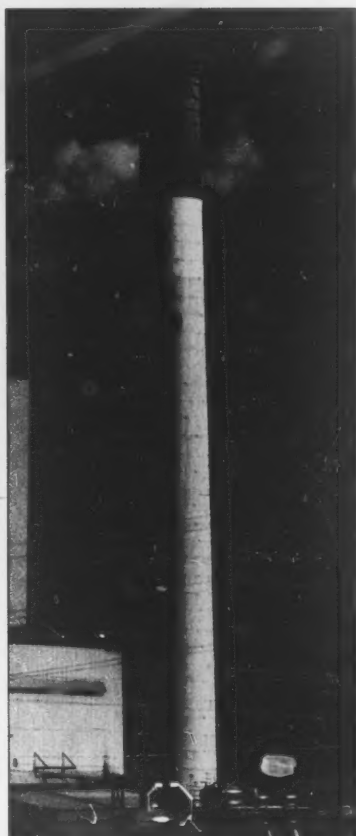
**Chemical recovery trends,
developments • 74**

**Separation technology
in the 1990s • 57**

**Environmental permitting
considerations • 139**

Designing an ONP recycling line • 78

FEBRUARY



FOCUS: STOCK PREPARATION

Separation technology 57

Advances in separation equipment and systems design will help paper industry solve environmental, recycling problems of 1990s

Adding old newspapers 78

Adding between 10% and 20% ONP can help newsprint manufacturers meet near-term marketing goals; levels of potential ONP usage are examined

Consistency measurement 104

Moving blade transmitters provide interference-free measurement of pulp consistencies and also require less maintenance

FOCUS: CHEMICAL RECOVERY

Spiral heat exchangers 60

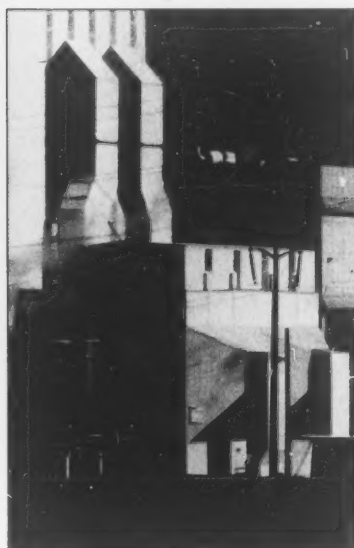
Advanced heat transfer, condensing capabilities make spiral heat exchangers ideal for use in chemical recovery applications

Recovery technology 74

Industry engineers discuss latest developments in chemical recovery, recausticizing area, as well as the influence of environmental concerns

Pinch valves 96

Improved design enables pinch valves to meet the harsh demands of pulp and paper mill chemical recovery/causticizing systems



THE COVER

This issue's focus on chemical recovery includes an in-depth analysis of the latest trends and developments in this vital area (p. 74), along with articles on specialized equipment applications in the recausticizing operation. (Photo of Louisiana-Pacific's new recovery boiler and recovery island at Somoa, Calif., courtesy of Louisiana-Pacific and Ahlstrom Machinery.)

FEATURES

PAPERMAKING

Hood exhaust energy use 106

Midwestern mill uses a moisture analyzer to study, alter drying hood operation, significantly reducing its energy costs

PULPING

Alcohol pulping 116

Repap's Alcell pilot facility at Newcastle, N.B., makes high-quality, environmentally "friendly" pulp—new commercial operation planned

POWER/STEAM

Maintenance programs 92

This month's concluding article in the boiler water treatment series recommends a mill and chemical supplier/consultant partnership to maintain boiler reliability, economy

ENVIRONMENT

Anaerobic treatment 127

More stringent mill effluent regulations, concentrated waste stream make anaerobic treatment systems a more viable option

Greenfield mill permitting 139

New and proposed environmental regulations are adding months and years to the permitting process; mill case history is examined

ENGINEERING

Pump parameters 115

Understanding the differences between available and required net positive suction head is important in pump selection and use

Seal-water control 130

Flowmeter-based control system cuts mill's refiner seal-water waste and helps solve consistency problems

PULP&PAPER

EDITORIAL STAFF

ATLANTA

Editor in Chief Ken L. Patrick
Technical Editor Jim Young
Projects Editor Kelly H. Ferguson

SAN FRANCISCO

Technical Editor Timothy A. Downs

CHICAGO

Technical Editor Andy Harrison

BRUSSELS

International Editors Peter Sutton
John Pearson
Hugh O'Brian

NEWS STAFF

SAN FRANCISCO

Executive News Editor Willard E. Mies
News Editor Carl P. Espe
News Editor Robert B. Galin
News Editor Sophie L. Wilkinson

NEW YORK

News Editor Noel DeKing

ETNA, MAINE

Senior News Editor Debra A. Garcia

PRODUCTION STAFF

SAN FRANCISCO

Managing Editor Margaret L. Brown
Art Director Nancy E. Bentley
Departments Editor William S. McClanahan
Copy/Production Editor Kurt F. Duecker
Technical Artist Jill Dupont

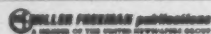
Atlanta: 2000 Powers Ferry Center, Suite 450
Marietta, Ga. 30067; (404) 952-1303; Fax (404) 933-0666
Chicago: 35 E. Wacker Drive, Chicago, Ill. 60601;
(312) 373-6238; Fax (312) 372-3864
San Francisco: 500 Howard Street, San Francisco, Calif.
94105; (415) 397-1881; Telex 278273; Fax (415) 543-0256
New York: 370 Lexington Avenue, New York, N.Y. 10017;
(212) 683-9294; Telex 220442; Fax (212) 725-0915
Etna, Maine: (207) 250-2494
Brussels: Chaussée de Charleroi 123a, Boite 5, B-1060,
Brussels, Belgium

PUBLISHING HEADQUARTERS

SAN FRANCISCO

Publishing Director Leigh M. Freeman
Group Publisher Leonard E. Haas
Director of Production Andrew A. Mickus
Director of Circulation Jerry M. Okabe
Ad Production Coordinator Anmarie Achacoso
Marketing Manager Paula J. Irons
Marketing Coordinator Robin M. Connery
Editorial Secretary Rose Tobin

Sales and business offices
are listed on Advertisers' Index page



Chairman of the Board Clifford D. Jakes
President Marshall W. Freeman
Senior Vice President Charles C. Baake
Senior Vice President Leonard E. Haas
Senior Vice President Thomas L. Kemp
Senior Vice President Wini D. Ragus
Vice President Charles H. Benz
Vice President Leigh M. Freeman
Vice President Andrew A. Mickus
Vice President Donald A. Pazour
Chief Financial Officer Stephen A. Daniels
Treasurer Miller Freeman III
Assistant Treasurer Douglas M. Denny

PULP & PAPER (ISSN 0033-4081), with which is combined Paper Mill News, Paper Trade Journal and Pacific Pulp & Paper, is published monthly except November when swimmonthly by MILLER FREEMAN PUBLICATIONS, 600 Harrison St., San Francisco, Calif. 94107. Second class postage paid at San Francisco and at additional mailing office. POSTMASTER: Please send address changes to PULP & PAPER, 600 Harrison St., San Francisco, Calif. 94107. © Copyright 1991 by Miller Freeman Publications Inc. All rights reserved. Subscriptions & Address Change: Sent without charge in the U.S.A. & Canada (upon written request) to individuals in pulp, paper, and board manufacturing firms and paper converting firms. To all others there is a subscription charge of \$85.00 a year in the U.S. All subscriptions to other countries: US\$105.00 a year, except Europe and Mediterranean, US\$120.00 (air service included). Single copy: US\$6.50, except Buyers Guide, US\$47.50, 16mm microfilm, 35mm microfilm, 105mm microfiche, an 1 article and issue photocopies are available from University Microfilms International, 300 N. Zeeb Rd., Ann Arbor, Mich. 48106; (313) 761-4700. Requests, subscription orders, and address changes must show name and position or job of individual, the name and location of mill, plant or office where employed, and the exact business or product produced at this location. Send subscription correspondence to: Circulation Department, PULP & PAPER, 600 Harrison St., San Francisco, Calif. 94107, or call Subscriber Service at 415-267-7645. For address change, include label from recent issue.

ABP

FEBRUARY

COLUMNS

From the Editors 7

by Ken Patrick
Effluent monsters bad for industry image

Recycling Update 41

by Andy Harrison
Federal Register notice by EPA

Career Development 43

by Roberta Bhasin
Delegating: what, to whom?

Maintenance Management 45

by Christer Idhammar
Maintenance assessments

Quality Report 147

by Lars Ingman
From fire fights to procedure to structure

Comment 186

by Norman Maclellan
Labor in the U.S. and Canada

DEPARTMENTS

Conference Calendar 47

News of People 151

New Products 155

Product Review 163

Literature 165

Bookshelf 167

Supplier News 169

SERVICES

Reader Service Review 154

Reader Service Card 154a

Professional Service

Directory 172

Classified Advertising 174

Advertisers Index 184

NEWS

Month in Statistics 9

U.S. paper and paperboard production data for November

Market Report 11

U.S. containerboard market stable
BCTMP price erosion may be slowing
Directory, offset prices hiked on Jan. 1

Grade Profile 13

Tissue: Firms push ahead on new capacity and manage to keep the price hikes coming

NEWS SCAN

Alberta-Pacific wins nod for mill 25

Cascades to restart Port Cartier 25

Celgar progresses with expansion 27

U.S. paper capacity growth revised 27

Contract bargaining winds down 29

Waterway contamination charged 31

Temple-Inland to reduce dioxin 31

European "dumping" hurting U.S. 31

G-P, Bowater studying venture 33

Fort Howard to install machine 33

Green Bay converts production 33

Federal sells five plants 35

Willamette to buy bag plants 33

IP to sell \$200 million in assets 37

USG fails to make debt payments 37

International News 39

SCA buys stake in MoDo

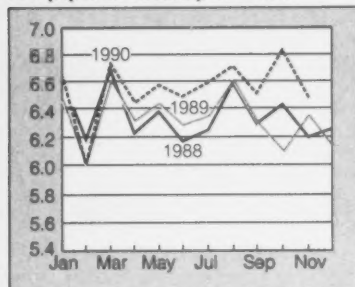
IP, not Smurfit, gets G-P units

Abitibi nixes Venezuela project

BPA

MONTH IN STATISTICS

U.S. paper and board production



U.S. production of paper and paperboard totaled 6.5 million tons in November, up 2.0% from a year earlier, according to the American Paper Institute. The seasonally adjusted rate of production stood at 78.4 million tpy, up 2.1% from last year. Paper production was up 2.9% over last year, more than twice the 1.3% gain posted for paperboard output. But API reports that paperboard has shown more strength than the paper sector since last summer, rising 2% above its rate for the first half of the year.

Among major grades, newsprint continued to show strong year-over-year growth thanks to newly installed paper machines, but consumption has recently trended downward in the U.S. market. Printing and writing shipments were up 3.2% over a year earlier, with unfilled orders relatively high for groundwood and uncoated free-sheet papers. Containerboard production for export was up 11.2%, but output for the much larger domestic market was only 1.9% ahead of the previous year.

Canadian newsprint shipments totaled 688,000 metric tons in November, down 15.7% from last year. Operating rates dropped to 81%, bringing the yearly rate to 90%. Woodpulp output totaled 652,000 tons, up 2.2%, with mills operating at 79%.

	Latest month (000 short tons)	% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
--	----------------------------------	------------------------------	--	------------------------------

PAPER & PAPERBOARD PRODUCTION¹

Newsprint	Nov.	564	9.3	6,587	8.7
Uncoated groundwood (s)	Nov.	153	0.0	1,770	0.1
Coated paper (s)	Nov.	606	-1.6	7,545	4.3
Uncoated free-sheet (s)	Nov.	943	1.4	11,544	3.6
Other printing/writing	Nov.	121	2.5	1,571	3.7
Total packaging and other paper (s)	Nov.	384	-10.5	4,646	-5.7
Tissue	Nov.	465	-1.9	5,788	2.5
Total paper	Nov.	3,237	0.1	39,451	2.8
Unbleached kraft paperboard	Nov.	1,716	8.6	20,246	3.6
Semichemical medium	Nov.	477	4.8	5,691	0.1
Bleached paperboard	Nov.	336	-11.3	4,376	-3.3
Recycled paperboard	Nov.	724	1.5	8,803	-0.4
Total paperboard	Nov.	3,253	4.1	39,115	1.3

Total U.S. paper and paperboard output	Nov.	6,489	2.0	78,566	2.1
---	-------------	--------------	------------	---------------	------------

PULP, WASTEPAPER & FIBER²

Total U.S. woodpulp production	Oct.	5,442	2.8	63,346	1.5
Market pulp production	Oct.	728	6.6	8,890	1.1
Wastepaper consumption at paper/board mills	Oct.	1,834	4.2	21,185	8.3
Pulpwood consumption (cords)	Oct.	8,517	2.2	99,572	0.7

CONVERTED PRODUCTS STATISTICS³

Corrugated box shipments (billion ft ³)	Nov.	24,955	-1.6	294,392*	1.4
Containerboard inventories at U.S. box plants and mills	Nov. 1	2,485	1.0		

INTERNATIONAL TRADE⁴

U.S. paper imports (including products)	Oct.	1,149	-1.6	13,138	1.3
Imports of Canadian newsprint	Oct.	668	-10.0	8,217*	-1.5
U.S. paper exports (including products)	Oct.	576	4.0	8,860	8.3
Exports of unbleached kraft linerboard	Oct.	203	2.0	2,656	18.9
Exports of woodpulp	Oct.	491	-2.2	5,989	-5.8
Norscan pulp inventories ⁵	Nov. 30	1,421	20.9		
Norscan pulp operating rates ⁶	Nov.	82%	87%	76%	87%

CANADIAN STATISTICS⁵ (reported in metric tons)

Total newsprint shipments	Nov.	688	-15.7	8,334*	-5.2
Operating rates	Nov.	81%	97%	90%	96%
Inventories held by U.S. consumers	Nov. 30	n.a.	—		
Other paper/board shipments	Nov.	625	3.8	6,858	7.2
Woodpulp shipments (export only)	Nov.	652	2.2	6,988	-8.0
Operating rates	Nov.	79%	93%	84%	94%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fibre Box Assn., Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. 6. Not annualized. (s) = Shipments.

Tissue: Firms push ahead on new capacity and manage to keep the price hikes coming

Grade structure: Tissue falls into two broad categories: sanitary and "other." Sanitary products predominate and include bathroom, facial, toweling, napkins, basestock for sanitary stock, wadding, and wipes. The "other" group, a mere 2% of the market, covers basestock for waxing, wrapping, and miscellaneous uses. The two major outlets for tissue are consumer and commercial and industrial (C&I). Consumer tissue accounts for 62% of the market and is purchased at retail outlets. Industrial tissue goes to hotels, offices, restaurants, factories, and institutions. Consumer tissue growth is expected to be half that of commercial products over the next few years. Typical basis weights for tissue include 12 to 14 lb/3,000 ft² for single-ply bathroom tissue and 32 to 39 lb/3,000 ft² for single-ply towel.

Production/capacity: The tissue industry is planning a flurry of new projects, though some analysts believe a few of the announcements are posturing by the industry. Among the potential projects is a new \$200-million mill being planned by Scott Paper Co. on the Ohio River near Owensboro, Ky. Along with some other investments, this should release the firm from the need to buy tissue paper. Construction should begin in 1991.

Fort Howard Corp. expects a mid-1991 startup for a fourth tissue machine at its Savannah River mill in Rincon, Ga., raising the mill's 100%-recycled tissue capacity 30%, or 225 tpd. Output will find its way primarily to the C&I market. The company will also put \$180 million into its Green Bay, Wis., tissue facility, expanding capacity by 20% by early 1993.

Potlatch Corp., which claims the premier position in private label and generic tissue products in the U.S., plans to start up a new tissue machine and shut down an old one at its Lewiston, Idaho, mill by 1992. The \$95-million effort will bring mill capacity to 124,300 tpy, up from 85,700 tpy.

Kimberly-Clark Corp. introduced its first baby wipes product in fall 1990. The firm also put up a C&I tissue mill in Loudon, Tenn. And the firm's new Jenks, Okla., facility is being dedicated to K-C's re-entry into the U.S. consumer bath tissue market.

The plant produces 68,000 metric tpy of consumer tissue.

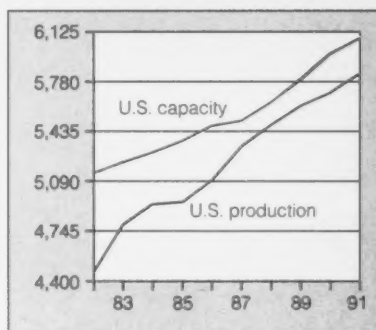
Procter & Gamble Co. is continuing its expansion in the consumer toilet tissue and paper towel market. It plans to pump about \$250 million into two new paper machines at an existing P&G plant east of the Rockies. Engineering studies for the project should be complete by the end of 1991. The firm is also planning a \$100-million tissue and towel expansion that could include a new machine in California, possibly in Oxnard.

Outlook: Slower economic growth will hold down gains in demand for both consumer and C&I tissue in 1991. The weakening economy could reshape demand, driving consumers to use lower-price tissue, hurting up-scale producers. Private-label products also do better under these conditions. And people eat out less in an economic dip, damping the demand for C&I tissue.

On the whole, however, both the consumer market and the C&I business are quite stable now. Tissue firms realized a 3% or so price hike on consumer tissue by mid-1990, though the introduction of Kimberly-Clark's Kleenex bath tissue late in the summer led to some promotional activity in the South. The industry's 5% across-the-board price hike in away-from-home tissue planned for late fall was moving into place toward year end and will probably result in a 3% rise. In 1991, analysts expect overall tissue prices will go up 2% to 3%, including some carryover from last year's hikes and a possible rise in second-half 1991.

Prices: Because of the highly competitive market for consumer tissue paper, the price of tissue paper per ton is not readily available. Price trends tracked by the Bureau of Labor Statistics' Producer Price Index (PPI) show relative changes in price levels. Note that this is an index and not a dollar/ton price. The PPI for converted sanitary paper products, including unconverted stock is as follows (1982 = 100): 1981, 98.2; 1982, 100; 1983, 102.1; 1984, 103.4; 1985, 106.6; 1986, 108.1; 1987, 109.1; 1988, 115.0; 1989, 126.0; 1990 (November), 130.6.

SUPPLY/DEMAND (000 tons)



FORECAST (000 tons)

U.S.	1989	1990e	1991e
Production	5,636	5,750	5,825
Capacity ¹	5,798	5,976	6,113
Utilization rate	97.2%	96.2%	95.3%
Imports ²	121	120	120
Exports ²	21	30	25
Apparent U.S. consumption	5,736	5,840	5,920
lb/capita	46.1	46.6	46.9
GNP ratio	1.39	1.40	1.41

e = estimate.

1. American Paper Institute data.

2. U.S. Dept. of Commerce data.

TOP U.S. PRODUCERS (000 tpy)

	Annual capacity	Market share (%)
1. Scott Paper	1,170	19.1
2. James River	1,110	18.2
3. Fort Howard	950	15.5
4. Procter & Gamble ¹	815	13.3
5. Georgia-Pacific	547	8.8
6. Kimberly-Clark	535	8.9
7. Chesapeake	190	3.1
8. Pope & Talbot	139	2.3
9. Orchids Paper	95	1.6
10. Marcal Paper Mills	88	1.4

Market share of top five companies:

75.1%

Market share of top ten companies:

92.2%

Total U.S. capacity (1991):

6.113 million short tons

1. estimate.

Celgar gets interim approval for expansion

Celgar Pulp Co. received mixed signals in an interim report issued Dec. 5 by the government panel reviewing its proposed C\$630-million mill expansion at Castlegar, B.C. The project, announced in October 1989, has been undergoing a first-of-its-kind review by a three-member independent panel put together by both the federal and provincial governments in community and technical hearings since September. The project would double bleached kraft pulp capacity to around 420,000 metric tpy.

The mill suffers from a poor environmental record, in part because the British Columbian government has given it variance permits over the years. The panel has concentrated on air and water quality, woodchip sup-

ply sources, and the impact of greater truck traffic. The final report was due in mid-January and must be approved by both governments, although technically the project could go ahead based on this report.

Although the federal and British Columbian governments granted "approval in principle" for the project, the panel's final report will recommend "that strict terms and conditions be imposed by permitting authorities," general manager R. Wilf Sweeney quoted from the interim report. He said Celgar is unlikely to proceed with the project until the panel makes clear what needs to be done in the final report, even though Celgar believes the expanded mill will meet all environmental requirements. ■

U.S. papermakers will increase manufacturing capacity for primary paper and paperboard by 7.5 million short tons during the next three years, according to the American Paper Institute's annual capacity survey. These capacity additions represent a 2.9% average annual growth rate during 1991-93. This rate is considerably lower than the 3.4% annual growth rate reported by producers last year, and the 1992 capacity level is now expected to be 1.7%, or 1.5 million tons, below the 1992 level reported in last year's survey. "Increasingly, uncertain economic prospects are resulting in delays, stretchouts, and cancellations of expansion projects," said API president Red Cavaney.

Although the results of API's thirty-third annual capacity survey signal a cutback in the recent boom in capital spending, capacity additions in 1991 alone will total 3.2 million tons, or 3.8%. This is the highest one-year rate of growth in industry capacity since 1973. Since these higher capacity additions in 1991 follow a two-year period when domestic production of paper and board increased by only 2.5% during 1989-90, there is considerable concern that industry operating rates will fall sharply next year. Total industry paper and board capacity is expected to reach 84.0 million tons this year, 87.2 million tons in 1991, 89.5 million tons in 1992, and 91.5 million tons in 1993.

Newsprint capacity growth. Newsprint capacity will increase 532,000 tons, or 8.4%, this year as new production from four new paper machines that started up in the 1989-90 period enters the market. This one-year increase exceeds all gains in newsprint capacity over the previous six years and will raise total industry capacity to 6.8 million tons in 1990. Capacity additions for printing/writing paper grades have been revised slightly downward for the second time. Following a below-trend 1.3% capacity increase for printing/writing paper in 1990, capacity growth will average 3.4% yearly in 1991-93. Five new paper machines that will produce uncoated and coated free-sheet grades are scheduled to be brought online. The demand growth for uncoated grades has been stimulated by the growing use of copiers and personal computers, but demand for coated paper for publishing and advertising has softened. In contrast to the free-sheet grades, capacity gains

CAPACITY SURVEY

U.S. paper capacity growth revised downward

	Additions 1991-93		Additions 1980-90	
	Three-year increase	Average annual growth	Ten-year increase	Average annual growth
Total all grades paper and paperboard	7,503	2.8%	15,464	2.0%
Total paper and paperboard	7,487	2.9	17,670	2.4
Total paper	3,711	2.8	9,552	2.6
Newsprint	602	2.9	1,992	3.5
Printing/writing	2,456	3.4	7,144	3.6
Packaging and industrial converting	189	1.1	(606)	(1.0)
Tissue	373	2.0	1,022	1.9
Total paperboard	3,776	2.9	8,118	2.2
Unbleached kraft	1,491	2.3	5,371	2.9
Solid bleached	670	4.6	439	1.0
Semichemical	226	1.3	599	1.7
Recycled	1,389	4.4	1,409	1.5
Construction grades	15	0.2	(2,206)	(6.8)
Total all grades woodpulp	3,689	1.8%	11,002	1.8%
Total woodpulp ¹	3,689	1.8	12,289	2.1
Dissolving and special alpha	3	0.1	(66)	(0.4)
Sulfite	(20)	(0.4)	(251)	(1.4)
Sulfate ²	3,626	2.3	10,721	2.4
Semichemical	18	0.1	87	0.2
Mechanical	62	0.3	1,799	3.1
Construction paper and board	(20)	(1.0)	(1,287)	(9.8)

1. Excluding pulp for construction paper and board.

2. Includes screenings. () = Decline.

Source: American Paper Institute.

Growth trends in U.S. capacity (000 short tons).

for uncoated and coated groundwood paper will come from rebuilding or upgrading existing machines. Uncoated groundwood capacity will remain virtually unchanged, while coated groundwood capacity will increase by only 1.7% annually in the 1991-93 period.

After a 3.1% tissue capacity increase in 1990, producers plan to add 373,000 tons of new capacity during 1991-93. These additions will yield a 2.0% annual growth rate, continuing a long-term growth trend that has averaged 1.9% annually over the last ten years.

Kraft linerboard: moderate gains. During the next three years, capacity for all containerboard grades (including recycled grades) will increase by 2.5 million tons, resulting in an annual rate of increase averaging 2.8%. However, capacity for kraft linerboard will increase at a lower rate of 1.9%. Gaylord Container Corp. started up a new kraft linerboard machine in 1990, but no other new kraft linerboard machines are scheduled to come online following Union Camp Corp.'s startup of a new machine in 1991. Recycled linerboard currently accounts for only 458,000 tons, or 2.3%, of total 1990 linerboard capacity. From this small base, capacity for recycled linerboard is expected to increase at an annual rate of 39% to reach 1.4 million tons in 1993. Recycled corrugating medium will increase at a lower 2.5% annual rate to reach 2.4 million annual tons in 1993.

Total woodpulp capacity will expand at lower rates than for many paper and board grades over the next three years because wastepaper use is expected to rise sharply. Industry capacity for woodpulp is projected to increase at an annual rate of 1.8%, reaching 69.2 million tons in 1993.

Market pulp capacity is growing at near-record levels as new production from Stone Container Corp., Weyerhaeuser Co., Union Camp, and Alabama Pine Pulp Co. comes on line. Capacity for bleached sulfate market pulp, which comprises nearly 80% of all market grades, will increase 5.2% annually, from 7.4 million tons in 1990 to 8.7 million tons in 1993.

Copies of API's 1990 capacity survey are available for \$350 each in the U.S. and \$375 overseas from Dept. CMS, American Paper Institute, 260 Madison Avenue, New York, N.Y. 10016. Phone: (212) 340-0600. Fax: (212) 689-2628. ■

LABOR

Canadian contract bargaining winds down

Operations resumed at Canadian Pacific Forest Products Ltd.'s newsprint mills in Thunder Bay, Ont., Gatineau, Que., and Dalhousie, N.B., following the holiday ratifications of three-year contracts modeled after the Canadian Paperworkers Union's pattern contract with Stone-Consolidated Inc. Over 3,000 striking CPU members returned to work at the CPFP mills after about four months, ending a tumultuous season of labor bargaining in eastern Canada that began in April when the previous contract covering about 35,000 industry workers expired. Negotiations are about 95% completed. CPU president Don Holder said.

While CPFP mills resumed operations, they had not reached full production as of Jan. 11 because the company did not have a full backlog of orders awaiting startup, a spokesman said. CPFP is a major supplier of newsprint to eastern U.S. publishers, and the industry continued speculation as to whether the end of the strikes would signal doom to the Jan. 1 newsprint price hike. Observers said when the mills return to full production, producers will likely have to offer increased discounts from the list price or formally roll back the price increase. Several CPU strikes in the summer and fall helped a 5% June 1 price hike succeed. At one point, 23% of Canadian newsprint capacity was idled in strikes at 11 mills, tightening supplies but not causing any shortages.

Despite the long strike at CPFP, the new contract closely resembles the pattern agreement reached in July at Stone's St. Maurice Valley mills rather than the one concluded with Abitibi-Price Inc. in October after a major disruption at seven of the company's mills. The CPFP agreement provides the company with greater flexibility in assigning work to tradesmen and allows it to operate its mills on two previous statutory holidays without union consent. Abitibi's contract requires union consent to run the mills on New Year's Day and Labor Day.

Neither side in the dispute at CPFP would comment on root problems in negotiations, but CPU's Holder said the union anticipated finding "the middle of the road" following

variations established between the Stone pattern and the Abitibi contract regarding the contentious issues. The CPFP contract was approved by over 80% of workers at Gatineau and Dalhousie but by only about 63% at Thunder Bay.

"You never have 100% satisfaction," Holder said. He added that in several of the strikes in 1990, company management refused to deal effectively with the issues of holidays and flexibility.

"What took place this year, took place on local issues," Holder continued. "Our industry in the '80s had fair and just settlements, and we expect it to continue in the '90s."

Meanwhile, production restarted Dec. 18 at Quebec & Ontario Paper Co.'s Thorold, Ont., 310,000-tpy recycled newsprint mill following the end of a four-month strike by 500 CPU workers. The mill was expected to reach full capacity early in January following the Christmas shutdown, a company spokesman said.

Stone-Consolidated said that negotiations with CPU at the New Richmond, Que., kraft linerboard mill were to resume Jan. 22, 1991, while talks at the Bathurst, N.B., complex would begin Feb. 11. Approximately 400 CPU members are employed at the Bathurst mills, which produce corrugating medium and newsprint-grade chemi-thermomechanical pulp.

UPIU achieves settlements. As of early January, the United Paperworkers International Union (UPIU) had reached agreement at all but one of the Canadian mills where it represents workers. Settlements were reached earlier at the Abitibi-Price Inc. newsprint mill in Pine Falls, Man., James River Corp. in Marathon, Ont., and Kimberly-Clark Corp. in Terrace Bay, Ont. A UPIU vice president in Wisconsin said that Canadian UPIU members received the basic pattern agreement wage hike "and a little bit better." Details on the contracts were not available, but the vice president said those mills achieved slightly different provisions regarding flexibility and holiday operations.

"We feel very positive with what we accomplished there," said Ed Windorff, vice president of UPIU Region 10. ■

ENVIRONMENT

Greenfield Mill Site Permitting Can Take Years of Preparation

New and proposed land, water, and air regulations are reviewed against a mill case history backdrop

By ROBERT B. KINSTREY

Several years ago, all that was required to site a greenfield mill was land (at least 200 acres for a 1,000-tpd kraft mill), water, access to railroad and highway, and perhaps a nearby electric transmission line. It was also helpful to have some political pull when negotiating items such as incentives, tax breaks, and building and environmental permits. Today it is a whole different story. Things that were taken for granted, such as land, are now tangled in an environmental briar patch.

Optec, Rust International's consulting engineering group, has been involved in the preliminary permitting of a 1,000-plus-tpd bleach kraft mill in the northern U.S. Since the location of the new mill is geographically limited by existing production facilities and woodlands, one might think the preliminary phase of site selection and fatal-flaw analysis would take about six months. This has not been the case. Eight months later, we are about halfway through the preliminary phase and envision that the full permitting process may take three to five years.

Table 1 outlines some of the major issues to be addressed during the preliminary phase. Many items on the list are self-explanatory and require no further discussion. I will, however, discuss those items that have either received recent public attention or caused us unforeseen headaches.

LAND. As mentioned, land choice has become a real thorn in our side. Section 404 of the Clean Water Act, Section 10 and Section 404 of the Rivers and Harbors Act of 1899, the Fish and Wildlife Coordination Act, and the "Swamp Buster" provision of the Food Security Act of 1985 give the Environmental Protection Agency (EPA), the Army Corps of Engineers (CE), the Fish & Wildlife Service (FWS), and the Soil Conservation Service (SCS) the responsibility for identifying and protecting wetlands. All four agencies have recently col-

Mr. Kinstrey is technical manager, Optec, Rust International Corp., Birmingham, Ala.

TABLE 1: Typical land, air, and water permitting for a greenfield kraft mill.

Land	Air	Water
Solid waste disposal facility	Air quality (PSD ¹ increments)	Baseline data • Water quality • Aquatic species
Wetland protection	Baseline conditions/data • Meteorological • Ambient air	Dioxin discharge
Chemical storage and spill protection	Stack height	Chloroform discharge
Dioxin in sludge	Site location issues: • Road/traffic • Water vapor • Water supply • Runoff control • Drainage control • Storm water management • Soils • Wastewater disposal • Ground water protection • Buffers • Historic sites • Unusual natural areas • Wildlife/fisheries • Scenic impact • Flooding • Open space • Odor • Erosion control • Sunlight — can't block solar collectors • Wood supply	TOCL/AOX discharge
	NSPS ² - Subpart Bb • Recovery boiler NSPS - Subpart Dd • Industrial boiler	Metal discharge
	Emissions • Particulate • SO₂ • NO_x • VOC • TRS • CO • H₂SO₄ • VE	Priority pollutants
	"Top Down" BACT	Toxic hot spots
	Visibility impairment	Bioassay requirements
	Issues related to local park and recreational facilities	Antidegradation: • Color • Foam • Odor • River classification • Thermal limits • Protected river • NSPS/NEPA³ • Water requirements • Treatment technology • BACT and NSPS • Indian issues • Spill collection/containment
	Emission source inventory	
	Clean air amendments	
	Chlorine emissions/limits	
	Toxic air pollutants	

1. Prevention of Significant Deterioration

2. New Source Performance Standards.

3. National Environmental Protection Act.

laborated and produced a common document that defines a wetland. Criteria for a "wetland" are shown in Table 2.

Think about the location of most paper mills and their proximity to bodies of water. Now think about wetlands. Most people envision a wetland as a large swamp, marsh, or bog. However, by today's definition, almost the entire state of Alaska is a wetland, as are major portions of most northern states.

What has changed? In recent years, various lawsuits have caused EPA to broaden its responsibility under the Clean Water Act to include all waters of the U.S., not just the navigable waters. EPA also has veto power over

the Corps of Engineers' issuance of permits for filling and dredging. As such, it has become the lead agency in protecting wetlands. In the past, the Corps of Engineers was fairly liberal in its policies of issuing permits for filling and dredging.

Now, because of increased recognition of how environmentally sensitive wetlands are and their importance in the global scheme, including the greenhouse effect, EPA and state agencies have become very inflexible when it comes to destroying wetlands. They steadfastly stand by their policy of no net loss. In the past, it was possible to show there were no other sites and that filling a "wetland" was the best economical alternative.

When the Tombigbee Waterway was built, it was understood that any wetlands destroyed by the new waterway would be replaced by building new wetlands. However, funding to build the new wetlands has not been approved. Some agencies do not even consider the replacement of wetlands an alternative. This makes it difficult to find enough land, especially contiguous land, to build a new mill. The wetland issue is a relatively new problem, and, as such, policies are still evolving and require a close watch.

WATER. The public consensus is that paper mills require large quantities of water and discharge "used process water" that contains total suspended solids (TSS), five-day biological oxygen demand (BOD₅), and other "pollutants" into local bodies of water.

A modern paper mill uses about 85% less water than it did 30 years ago. Tables 3 through 5 show how process

TABLE 2: Wetlands.

Wetlands possess three essential characteristics:

- 1. Hydrophobic vegetation —**
Macrophytic plant life growing in water, soil, or substrate that is at least partially deficient in oxygen as a result of excess water content.
- 2. Hydric soils —**
Soils that are saturated, flooded, or ponded long enough (one to four weeks) during the growing season to develop anaerobic conditions.
- 3. Wetland hydrology —**
Permanent or periodic inundation or soil saturation to the surface, at least seasonally, are the driving forces behind wetland formation.

TABLE 3: Integrated kraft mill wastewater discharge, gal/ton product.

Technology	Bleached	Unbleached
1964 — older	110,000	90,000
1964 — current	45,000	27,000
1964 — new	25,000	16,000
1990 — design	16,000	8,000
% reduction — 1964 older vs 1990	85%	91%

TABLE 4: Integrated kraft mill TSS waste load, lb/ton product.

Technology	Bleached	Unbleached
1964 — older	200	170
1964 — current	170	130
1964 — new	90	80
1990 — design	50	45
% reduction — 1964 older vs 1990	75%	73%
Discharge to receiving water at 90% reduction in waste treatment plant	5	

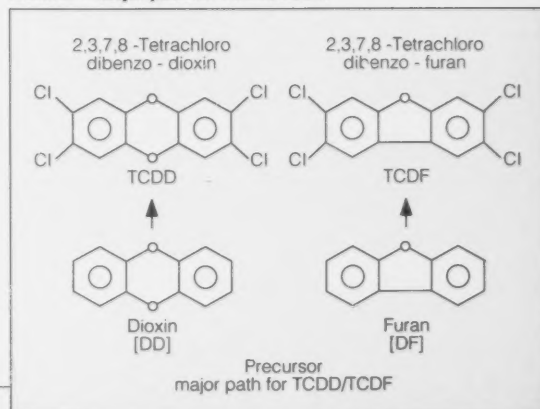
TABLE 5: Integrated kraft mill BOD₅ waste load, lb/ton product.

Technology	Bleached	Unbleached
1964 — older	200	160
1964 — current	120	90
1964 — new	90	80
1990 — design	60	50
% reduction — 1964 older vs 1990	70%	69%
Discharge to receiving water at 95% reduction in waste treatment plant	3	

TABLE 6: Water consumption by grade, gal/machine-dried ton (MDT).

	Unbleached kraft	Bleached kraft	NSSC	TMP
Pulp mill	7,000	7,000	2,600	2,500
Bleach plant		7,000		
	Kraft sack	Fine	Corrugating medium	Newsprint
Paper mill	3,000	7,000	4,000	6,000
Total	10,000	21,000	6,600	8,500

FIGURE 1: Major path for TCDD/TCDF.



improvements and "closing up" of mills have reduced the wastewater and waste-load quantities. The 1964 data are from the 1967 Paper Mills Industry Waste Water Profile prepared by the Federal Water Pollution Control Administration.

Today, BOD₅ and TSS discharged into the local receiving stream is less than 5 lb/ton of product. This is below the Federal Regulation 40 CFR Part 430 effluent guideline for new sources. Table 6 shows water consumption currently used by several more popular pulping processes.

Hardly anyone knew the word dioxin five years ago, but today it is a household word. Following is a brief history:

- 1985—2,3,7,8 TCDD (tetrachloro dibenzo dioxin) was found in fish downstream from a paper mill and subsequently found in mill effluent.

- 1988—National Council of the Paper Industry for Air & Stream Improvement (NCASI) reported on a five-mill study that showed TCDD and TCDF (tetrachloro dibenzo furan) were formed in bleaching operations.

- March 1988—PAPRICAN (Pulp & Paper Research Institute of Canada) reported finding precursors DBF (dibenzofuran) and DBD (dibenzodioxin) in defoamers and oil.

Figure 1 shows the major path for the creation of the tetrachlorinated products from the nontoxic precursors.

Dioxin is a potent carcinogen in rats. It accumulates in the fatty tissues of animals. Thus, it can enter the human food chain. Levels detectable in pulp are measured in parts per trillion (ppt) and parts per quadrillion (ppq) in paper mill effluent. These numbers should be put in perspective:

- One ppt is equal to one pint of vermouth in 10 million gal of gin.

- One ppq is equal to one sec in 30 million years.

It is not known at what level dioxin affects human health.

The paper industry is not the primary source of dioxin (Figure 2) but has gotten a lot of attention due to

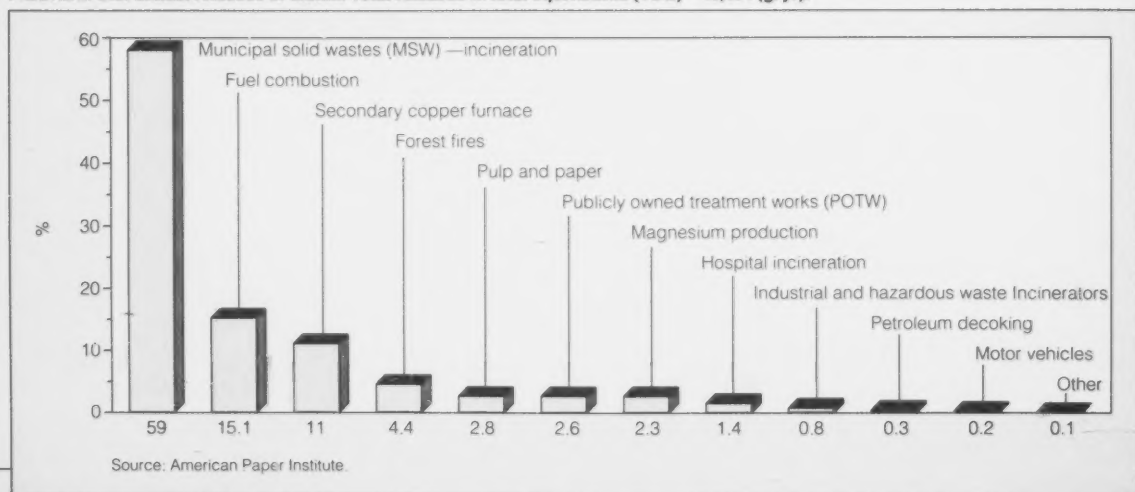
the efforts of groups such as Greenpeace. The total annual release in the U.S. is 88.5 lb. The paper industry releases 2.8 lb annually.

Shelly Stewart, Greenpeace's director of pulp and paper operations, stated at a recent Gulf Coast TAPPI meeting that Greenpeace targeted the paper industry because dioxin is a byproduct that no one cares about (i.e.,

TABLE 7: AOX, TOCL, dioxin reduction plan.

- Good chip preparation
 - Chip thickness screening
 - Chip bark content less than 0.7 %
- In-digester extended delignification
- Brownstock screening with good shive removal
- Three stages brownstock pressure washing
 - Entrained less air, thus less defoamer required
- Use of an O DcEorD D bleach sequence
- Oxygen delignification followed by two stages of post-oxygen washing
 - Strips out precursors if operated above 100°C
 - Lowers kappa number entering bleach plant, thereby lowering chlorine requirement
 - Reduces liquor/defoamer carryover
- Dc stage
 - 0.17 chlorine multiple
 - 70 % ClO₂ substitution
 - Multiple ClO₂/Cl₂ injection points
- Eor stage
 - Reduces amount of chlorinated bleaching agents needed
- Two D stages
 - More forgiving
 - Reduces chemical consumption
- Sophisticated distribution control system
- Activated waste treatment system

FIGURE 2: U.S. annual releases of dioxin. Total releases in total equivalents (TEQ)—40,134 (g/yr).



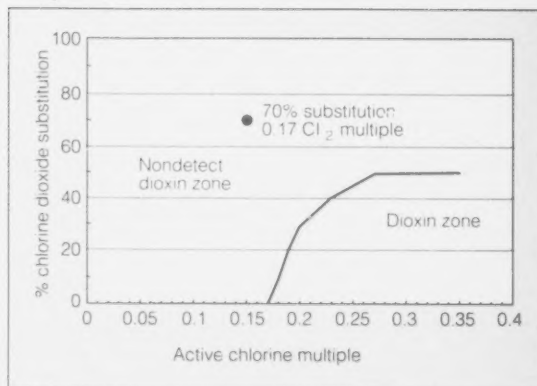
the quantity is so small, why worry about it). This is part of what Greenpeace calls "a tyranny of small decisions." The accumulation of many micro actions will cause the demise of the world. Stewart would like to see the paper industry "chlorine free by '93."

A modern bleach kraft mill using the latest technology will produce effluent in which dioxin will be non-detectable. However, controlling dioxin alone will not solve the problem of chlorinated byproducts in the effluent. Many countries, such as Sweden, are taking steps to control total organic chlorides (TOCL) and absorbable organic halogens (AOX). Controlling TOCL and AOX will also control dioxins. Processes used to control AOX, TOCL, and dioxin are shown in Table 7.

Figure 3 shows the combined effects of high chlorine dioxin substitution and a low chlorine multiple (chlorine multiple is equal to the percent of active chlorine on an oven-dry pulp basis, divided by the kappa number entering the bleach plant).

Color is emerging as the next hot issue. Maine has recently promulgated legislation to limit color from new sources to 75 lb/ton and from existing sources to 150 lb/ton. Modern bleach plants for softwood pulps will have a difficult time meeting these limits. Even employing all the latest technology for plant processing, expensive end-of-pipe treatment, polymer addition to secondary clarifiers, and/or air flotation cells may have to be used.

FIGURE 3: Chlorine dioxin substitution vs active chlorine multiple.



AIR. Tell someone that a kraft mill is going to be built in their town and one of the first comments will be, "Why do we want one of those smelly things built here?" Today, a modern mill is essentially odor free. Odor from mills like Leaf River Forest Products Inc. in New Augusta, Miss., or Union Camp Corp. in Eastover, S.C., cannot be detected at the property line—unlike older mills from which odor can be detected while traveling on an interstate highway 20 miles away. Eliminating odors from a kraft mill is the result of process changes.

There are primarily four of them: 1) installation of TRS (total reduced sulfur) gas collection and incineration systems, 2) installation of the low-odor recovery boilers in which the direct contact cascade evaporator using fluegas to thicken the black liquor has been replaced with concentrators that use steam, 3) oxidizing lime mud prior to calcining, and 4) the use of spill monitoring and collecting systems. The latter minimizes odor released from the waste treatment system and also BOD_5 .

Emission limits from the various combustion units in use at a paper mill have been reduced through the years as the technology has advanced. Best available control technology (BACT) results in the extremely low limits shown in Table 8. Electrostatic precipitators are being used for

TABLE 8: Summary of air emission limits.

Emissions site	Pollutant	Projected lowest emissions limit	Status
Recovery furnace	PM/PM10	0.021 gr/dscf ¹ @ 8% O ₂	achievable
	VE	20% opacity	achievable
	TRS	5 ppm @ 10% O ₂	achievable
	SO ₂	100 ppm _{dv} ² @ 8% O ₂	achievable
	NO _x	100 ppm _{dv} @ 8% O ₂	achievable
	CO	169 ppm _{dv} @ 8% O ₂	demonstrated @ 250 ppm _{dv} @ 8% O ₂
	VOC	6.8 ppm _{dv} @ 8% O ₂	demonstrated @ 75 ppm _{dv} @ 8% O ₂
	H ₂ SO ₄	62 ppm _{dv} @ 8% O ₂	achievable
Wood waste boiler	PM/PM10	0.03 lb/mm Btu	achievable
	VE	20% opacity	achievable
	SO ₂	0.27 lb/mm Btu	achievable
	NO _x	0.15 lb/mm Btu	achievable
	CO	0.4 lb/mm Btu	achievable
	VOC	0.010 lb/mm Btu	achievable
Lime kiln	PM	0.1 gr/dscf @ 8% O ₂	achievable
	VE	20% opacity	achievable
	TRS	5 ppm @ 10% O ₂	achievable
	SO ₂	90 ppm _{dv} @ 10% O ₂	achievable
	NO _x	250 ppm _{dv} @ 10% O ₂	demonstrated @ 310 ppm _{dv} @ 8% O ₂
	CO	155 ppm _{dv} @ 10% O ₂	achievable
	VOC	1 lb/ton CaO	achievable
Smelt dis tank	PM/PM10	0.127 lb/ton BLS	achievable
	VE	20% opacity	achievable
	TRS	0.033 lb/ton BLS	achievable
	SO ₂	0.067 lb/ton BLS	achievable

1. Grains/dry standard ft³.
2. ppm dry volume.

all sources, and some also use scrubbers. Some waste-fuel boilers are now injecting either ammonia or urea into the fluegases prior to release to control NO_x by selective noncatalytic reduction (SNCR).

Visible emissions released from mills are a concern in many states. The most visible emissions are water vapor plumes from cooling towers and paper machine hood exhaust fans. In the future, you may see reheating equipment installed to minimize these plumes.

OTHER REQUIREMENTS. Tables 9 through 11 show some of the other process requirements, e.g., wood, electric power, and steam from various paper mill configurations. Kraft mills are essentially self-sufficient, in that the steam and electricity generated by the burning of black liquor, bark, and sludge is more than enough to produce the pulp. Additional fossil fuels would have to be consumed to generate enough power to convert the pulp to a final product. Groundwood operations, on the other hand, require substantially higher quantities of electric power.

Another example of how kraft mills have reduced their impact on the environment is the reduction in lime kiln fuel use. Several years ago, most kilns used in excess of 10 million Btu/ton. Today, new kilns use about 5 million Btu/ton. Tomorrow, 4.54 million Btu/ton may be possible if the vertical calciner currently under construction works.

TABLE 9: Wood required.

	Cords/MDT	Acres/day ¹
TMP	.95	27
High yield kraft	1.6	46
Bleached kraft	2.4	69

1. For 1,000 MDTpd mill, 20 yr plantation yield 35 cord./acre

TABLE 10: Electric power consumed by grade, kW/MDT.

	Unbleached kraft	Bleached kraft	NSSC	TMP
Pulp mill	235	400	400	2,000
Bleach plant		150		
	Kraft sack	Fine	Corrugating medium	Newsprint
Paper mill	750	800	450	500
Total	985	1,350	850	2,500

TABLE 11: Steam consumed by grade, lb/MDT.

	Unbleached kraft	Bleached kraft	NSSC	TMP
Pulp mill	8,000	10,000	8,000	335
Bleach plant		5,000		
	Kraft sack	Fine	Corrugating medium	Newsprint
Paper mill	8,800	8,575	8,000	7,100
Total	16,800	23,575	16,000	7,435

THE TRUE STOCK SAMPLE SYSTEM THAT CAN'T CLOG

Strahman's Original Piston-Type Sampling Valve

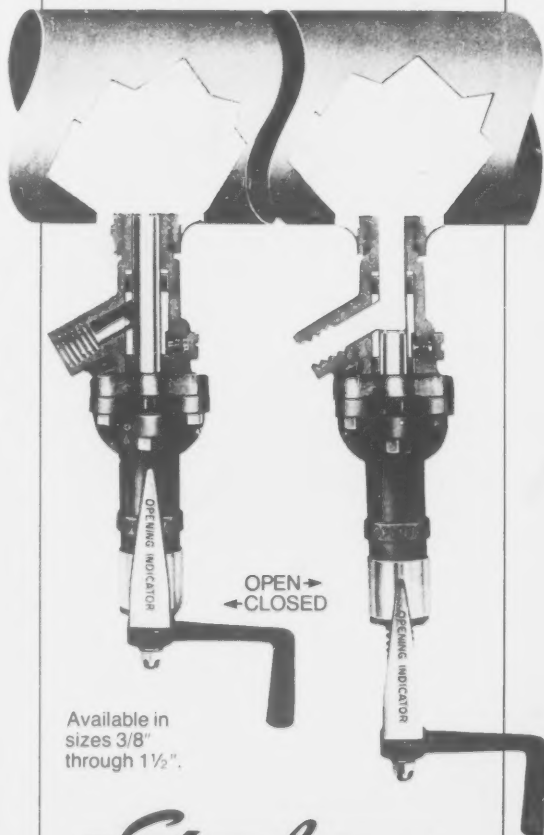
Other valves can jam up or become contaminated. "Dipping" for samples is unreliable. But the Strahman System gives you a stock sample that's both accurate and easy to obtain.

When in the closed position, the stainless steel piston extends flush with the inner surface of the pipe, vat or tank to which it is connected. When retracted, an accurate free-flowing stock sample is guaranteed because it is impossible for any foreign matter to block the valve, as the piston takes up the whole interior of the valve. The valve is sealed by two replaceable Teflon rings.

For pipeline use, sampling valves can be installed with insert flanges, special half couplings or special tees. For vat or tank installations they are attached by means of special half couplings.

An opening indicator has been incorporated on the 3/8" thru to 1" hand operated models to indicate when the valve is about to open.

For safe, dependable performance in both sampling or drainage, the Strahman System can't be beat. Available in hand, air and hydraulically operated models.



Available in sizes 3/8" through 1 1/2".

Strahman
VALVES INC. 3 Wheeland Rd. Fortman Pk. N.J. 07932 (201) 377-4900